CLAIMS

1. A method for enabling parity declustering in a balanced parity array of a storage system, the method comprising the steps of:

combining a plurality of unbalanced stripe arrays to form the balanced array, each unbalanced stripe array having parity blocks on a set of storage devices that are disjoint from a set of storage devices storing data blocks; and

distributing assignment of storage devices to parity groups throughout the balanced array.

2. The method of Claim 1 further comprising the step of, after a single or double storage device failure, ensuring that all surviving data storage devices are loaded uniformly during reconstruction of the failed storage device or devices.

3. The method of Claim 1 wherein the storage system is a filer.

4. The method of Claim 1 further comprising the steps of:

dividing each storage device into blocks; and

organizing the blocks into stripes across the devices, wherein each stripe contains data and parity blocks from each of the devices of the balanced array.

5. The method of Claim 4 wherein the step of distributing comprises the step of selecting patterns of characters representing data storage devices of a stripe to thereby change the association of the data storage devices with parity groups from stripe to stripe of the balanced array.

6. The method of Claim 5 wherein the characters are binary numbers.

7. The method of Claim 5 wherein the characters are ternary numbers.

8. The method of Claim 1 further comprising the steps of:

configuring the balanced array as a RAID-4 style array;

initially under-populating the array with storage devices; and

adding storage devices until a fully populated array of predetermined size is achieved.

9. The method of Claim 8 wherein the storage devices are disks.

10. A system that enables parity declustering in a balanced parity array of a storage system, the system comprising:

a plurality of storage devices, each storage device divided into blocks that are further organized into stripes, wherein each stripe contains data and parity blocks from each of the devices of the balanced array;

a storage operating system including a storage layer configured to implement a parity assignment technique that distributes assignment of devices to parity groups throughout the balanced array such that all storage devices contain the same amount of data or parity information; and

a processing element configured to execute the operating system to thereby invoke storage access operations to and from the balanced array in accordance with the concentrated parity technique.

11. The system of Claim 10 wherein the storage layer further combines a plurality of unbalanced stripe arrays to form the balanced array, each unbalanced stripe array having parity blocks on a set of storage devices that are disjoint from a set of storage devices storing data blocks.

12. The system of Claim 11 wherein the storage devices are disks and wherein the storage layer is a RAID layer.

13. The system of Claim 12 wherein the RAID layer is implemented in logic circuitry.

14. The system of Claim 10 wherein the storage system is a network-attached storage appliance.

15. The system of Claim 10 wherein the storage devices are one of video tape, optical, DVD, magnetic tape and bubble memory devices.

16. The system of Claim 10 wherein the storage devices are media adapted to store information contained within the data and parity blocks.

17. Apparatus for enabling parity declustering in a balanced parity array of a storage system, the apparatus comprising:

means for combining a plurality of unbalanced stripe arrays to form the balanced array, each unbalanced stripe array having parity blocks on a set of storage devices that are disjoint from a set of storage devices storing data blocks; and

means for distributing assignment of devices to parity groups throughout the balanced array such that all storage devices contain the same amount of data or parity information.

18. The apparatus of Claim 17 further comprising:

means for dividing each storage device into blocks; and

means for organizing the blocks into stripes across the devices, wherein each stripe contains data and parity blocks from each of the devices of the balanced array.

19. The apparatus of Claim 18 wherein the means for distributing comprises means for selecting patterns of characters representing data storage devices of a stripe to thereby change the association of the data storage devices with parity groups from stripe to stripe of the balanced array.

20. A computer readable medium containing executable program instructions for enabling parity declustering in a balanced parity array of a storage system, the executable program instructions comprising program instructions for:

combining a plurality of unbalanced stripe arrays to form the balanced array, each unbalanced stripe array having parity blocks on a set of storage devices that are disjoint from a set of storage devices storing data blocks; and

distributing assignment of devices to parity groups throughout the balanced array such that all storage devices contain the same amount of data or parity information.

21. The computer readable medium of Claim 20 further comprising program instructions for:

dividing each storage device into blocks; and

organizing the blocks into stripes across the devices, wherein each stripe contains data and parity blocks from each of the devices of the balanced array.

22. The computer readable medium of Claim 21 wherein the program instructions for distributing comprises program instructions for selecting patterns of characters representing data storage devices of a stripe to thereby change the association of the data storage devices with parity groups from stripe to stripe of the balanced array.